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X. *On the Conversion of Animal Substances into a fatty Matter much resembling Spermaceti.* By George Smith Gibbes, B. A.  
*Communicated by George Shaw, M. D. F. R. S.*

Read March 12, 1795.

IN a paper which the Royal Society have done me the honour of inserting in the last Volume of their Transactions, I related some experiments on the decomposition of animal muscle. I regret that it has not been in my power to pursue these inquiries with the attention the subject seems to demand. I beg leave, however, to present the few additional facts contained in this paper, not by any means as a full investigation of the subject, but as serving to excite the attention of those, who have more opportunities, and are better qualified, to pursue such inquiries.

I mentioned in my former paper, that the substance procured either by means of water, or the nitrous acid, appeared to me to have precisely the same external characters; but I have observed since, that there is a difference between that which I obtain from quadrupeds, and that which is procured from the human subject: the former seems not disposed to crystallize, while the latter assumes a very beautiful and regular crystalline appearance.

The matter which I procured from human muscle was melted, into which I plunged a very sensible thermometer,

which soon rose to  $160^{\circ}$ ; it began congealing at  $112^{\circ}$ , and became so solid at  $110^{\circ}$  that the thermometer could not easily be taken out.

I took some of the spermaceti of the shops, and under the same circumstances I plunged the same thermometer into it. It soon rose to  $170^{\circ}$ ; a pellicle was formed at the top of it when at  $117^{\circ}$ ; and it became so solid at  $114^{\circ}$ , that the thermometer could not easily be taken out.

I dissolved a piece of the substance, which I had formed by means of water and the nitrous acid, in boiling spirits of wine; on cooling this mixture, a great quantity of this waxy matter was separated in the form of beautiful flakes. I could not procure large crystals, but the flakes assumed a crystalline appearance.

I put into an earthen retort some of this waxy matter, to which I added some finely powdered charcoal; on applying a pretty strong fire, a small quantity of an oily fluid came over, which concreted on cooling; after which came over a prodigious quantity of thick white vapours, which were very suffocating and offensive.

I had a copper retort made, for the purpose of trying some experiments on this matter. I put a small quantity into it, and placed it on a common fire; there came over first a limpid fluid like water, without much smell; on the addition of more heat, there came over an oily fluid, which soon coagulated, of a firmer consistence than when put in, and coloured of a beautiful green by the copper; this last circumstance proves that it contained no ammonia.

Having procured some very pure quicksilver, I took a glass, which contained about 10 pounds of that fluid, with which I

filled it; I inverted it in a bason, which contained the same fluid; I introduced a small piece of lean meat, and also a small quantity of water; at the end of about six weeks, so great a quantity of gas was disengaged as nearly to occupy the whole of the vessel; the meat had assumed a white appearance.

Since I mentioned my former experiments on the cow, which I had submitted to the action of running water, I have observed a few facts relating to the changes which took place. This cow was placed in a situation where the water could come twice every day, as before described; over it some loose earth was thrown; after it had remained some time in this place, I used frequently to push a stick through this earth to the cow; every time this was done there came up a prodigious quantity of air, after I had suffered it to remain quiet for a short time. Since I put this cow in this situation, I have had two horses and another cow placed under the same circumstances; in all of them this disengagement of air takes place; this air is extremely offensive.

In the former cow the whole muscular part seemed changed; and from the substance formed I have procured a very large quantity of a waxy substance by means of the nitrous acid. Though the nitrous acid takes off the greatest part of the foetor from the substance thus formed, yet it gives it a yellow colour which is with difficulty removed, and a peculiar smell, evidently similar to the smell of the acid employed, which mere washing and the addition of alkalies will not entirely remove.

My father, who has been indefatigable in his attempts to whiten this substance, finds that the following process will make it very pure, and very beautiful, though not so white as

the spermaceti of the shops. The cow, which had lain in the water for a year and an half, was taken up, and we found that the whole muscular part was perfectly changed into a white matter; this was broken into small pieces, and was exposed to the action of the sun and air for a considerable length of time. By these means it lost a great deal of its smell, and seemed to acquire a firmer consistence. The appearance of this substance was somewhat singular; for on breaking it, we found little filaments running in every direction, exactly similar to the cellular substance between the muscular fibres. These pieces were then beaten to a fine powder, and on this powder was poured some diluted nitrous acid; after the acid had been on it for about an hour, a froth was formed at the top; the acid was then poured off, and the substance was repeatedly washed; it was then melted in hot water, and when it concreted it was of a very beautiful straw-colour, without the least offensive smell, on the contrary, it had the agreeable smell of the best spermaceti. May not this substance be applied as an article of commerce? Great quantities of it may be obtained. It burns with a fine flame; and dead animals, which at present are of little or no use, may be changed into it. I am very sorry that it has not been in my power to ascertain the precise quantity which may be obtained from a given quantity of flesh; but from what I have obtained, I can say that it would be very considerable. The running water carries off a great deal of it, but that might be obviated by the addition of strainers. Moreover, that which is carried off by the water is the purest, for I always take care to get as much as possible of it, because I find it gives me less trouble in purifying it. The water over the animals, and for some distance round them, is covered with

a very beautiful pellicle, which is white in general ; sometimes it refracts the sun's rays, producing the prismatic colours.

Fish may be also changed ; and I recollect having seen in some old author, whose name I cannot recollect, a passage in which he mentions a circumstance where something of this kind happened in a whale. He says, that after this fish has been putrifying on the shore some time, the people have a secret by which they can procure and purify lumps, which they find to be similar to the spermaceti which they get in the usual way.

I have heard from many people, observations which they had made where this substance had been formed, and which they could not account for ; but as the circumstances were the same as those beforementioned, I shall forbear giving additional trouble.

On seeing a body opened some time ago, where there was a great collection of water in the cavity of the thorax, I observed that the surface of the lungs was covered with a whitish crust. I remarked to a friend, that I thought this crust was owing to some combinations which had taken place between the lungs or pleura and the serous fluid effused, similar to what I had observed between flesh and water ; or that the serous fluid had acted on the coagulable matter, and had produced a similar change.

Dr. CLEGHORN mentions a circumstance, which in some measure seems to agree with the observation then made. As the fact is a curious one, I shall subjoin the following extract. He is speaking of abscesses formed in the lungs. “ These abscesses had sometimes emptied themselves into the cavity of the thorax, so that the lungs floated in purulent serum, their

“ external membrane, and likewise the pleura, being greatly  
 “ thickened, and converted as it were into a white crust, like  
 “ melted tallow grown cold.” In a note he says, “ I am now  
 “ doubtful if this crust was the pleura and external coat of the  
 “ lungs, changed from a natural state by soaking in a puru-  
 “ lent fluid, and if it was not altogether a preternatural sub-  
 “ stance, formed by fluids deposited on those membranes, and  
 “ compacted together by the motion of the lungs.”

Much has been said by many authors on the subject of secretion. It was at one time supposed that it depended on some peculiar property of the living principle; and it was thought impossible to form any secretion but through the medium of secreting organs. M. FOURCROY has, however, contradicted this by the experiments where he forms bile.

Spermaceti is an animal substance, secreted in a particular species of whale, and the substance which is formed in the foregoing experiments, as far as I can judge, agrees with it in every particular.

M. FOURCROY says, that M. POULLETIER DE LA SALLE found a crystallized inflammable substance similar to spermaceti in biliary calculi.

May not the suety matter in steatomatous tumours arise from something of this kind?

By attending to the various secretions of the body, by examining their composition in the healthy and morbid states of the system, may we not expect to derive great advantage, particularly when accurate experiments are applied towards the relief of disease?

Some excuse may perhaps seem necessary for the little attention which has been paid to the accurate results in the

different experiments; particularly so, as the analysis of every part of the animal body, except the bones, is at present so incomplete; but I hope that the time necessary for my medical pursuits, and the want of a complete chemical apparatus, will not render the simple facts I have here related less useful.

I have not attempted to account for the various phænomena which appear in the experiments, because the facts seem too few to admit of any general conclusion.

If the above experiments should appear to the Society worthy of their attention, the application of my former experiments, and the results of some which I hope to make, on some animals that are placed under different circumstances favourable to their decomposition, shall be the basis of a future paper.